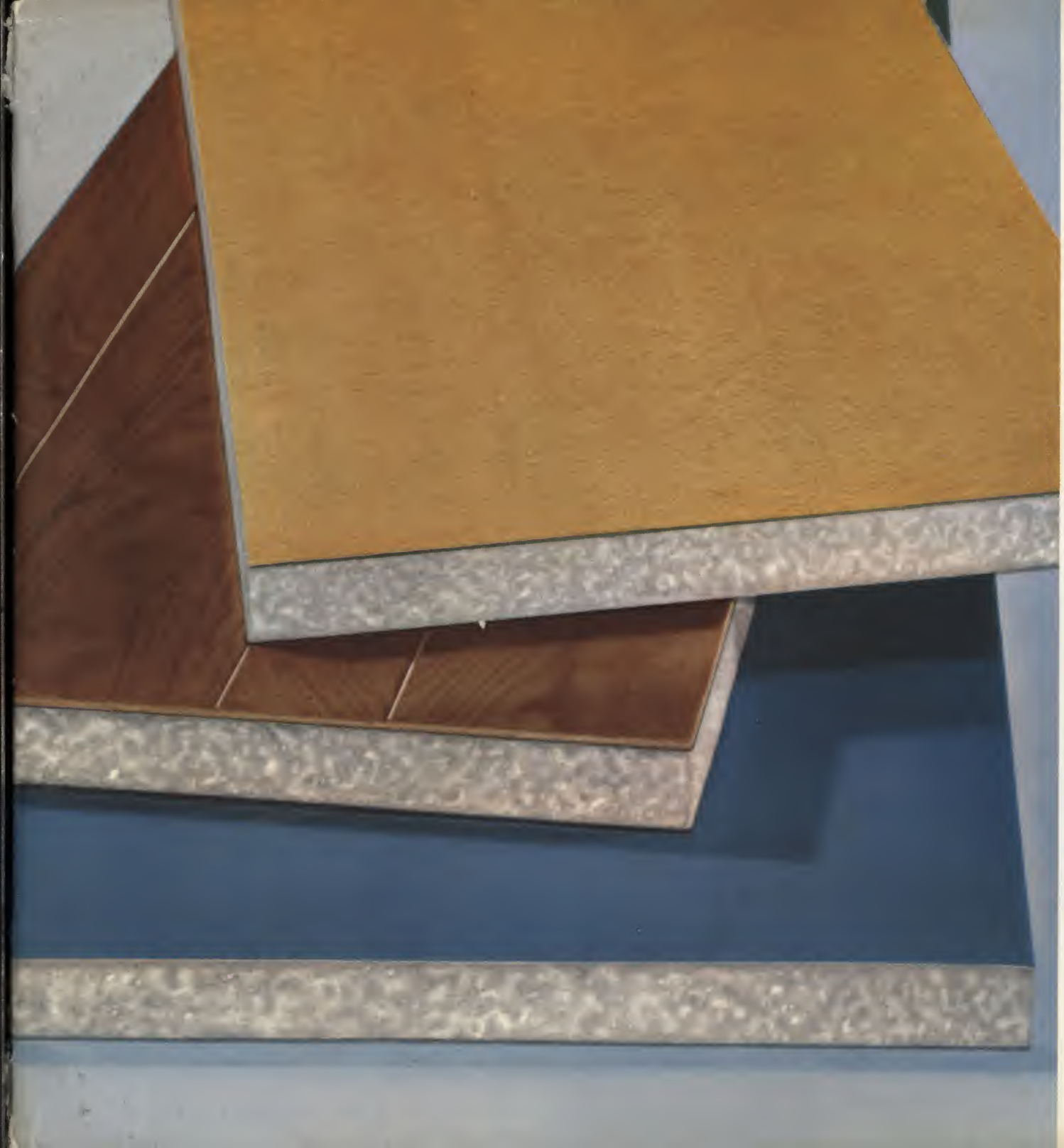


THIS IS ALPLY

NEW ALCOA PANEL

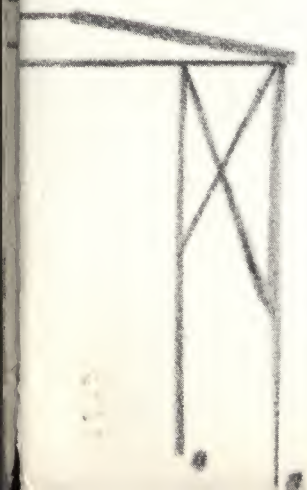
ALUMINUM COMPANY OF AMERICA

ALCOA ALPLY...THE NEWEST BUILDING MATERIAL...LIGHT...STRONG...ECONOMICAL

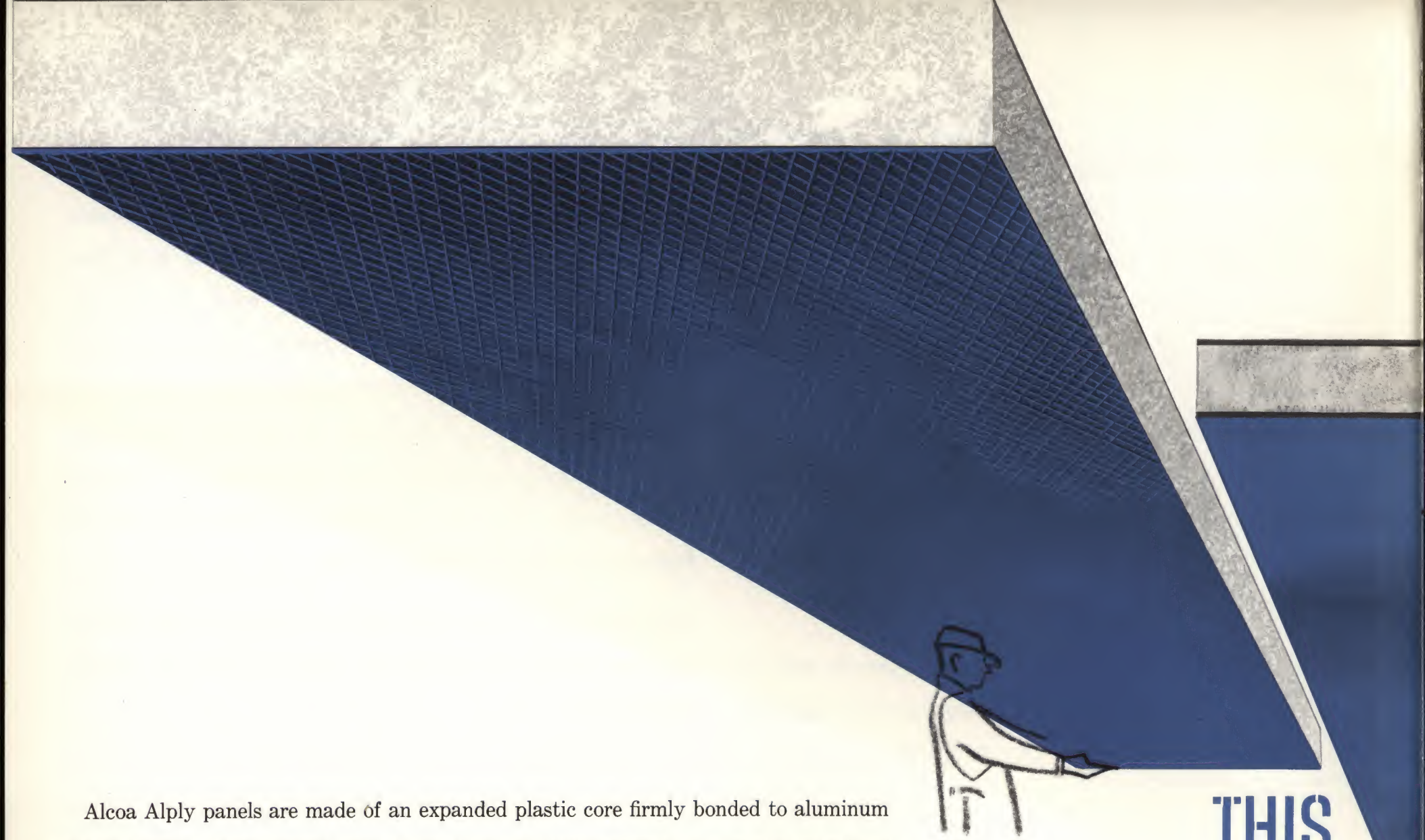
Alcoa* Alply insulated panels open up entirely new and unique dimensions for builders and manufacturers. Combining aluminum's advantages with other materials in a complete, integral panel, Alply offers opportunities for heretofore impossible simplification and economy in a wide range of uses. In architectural applications, it provides an almost limitless combination of beauty and durability at low cost. Because it lends itself to simpler, more economical *production* techniques, Alply points the way to more efficient and lower cost building applications. Newest and most revolutionary *product* of its kind, its uses are limited only by the imagination.

What is Alply's potential for you? What can you do with it? Versatile, functional, its range is tremendous and only beginning to be fully explored. Alply, with its rigid plastic core, firmly bonded and sandwiched between aluminum sheets or aluminum in combination with other materials, is produced to desired strength, insulation value, surface finish and color. Alply can be cut, mitered, shaped and formed. It possesses superior strength-weight characteristics. Panels are erected simply, quickly, by basic joining techniques. Alply panels are one of the largest self-insulating, structurally self-sufficient building units now available on the market. They are a building component that can be used with or without auxiliary framing.

Alcoa Alply panels, mass produced by a newly developed manufacturing process, are available in volume to suit your specific requirements.



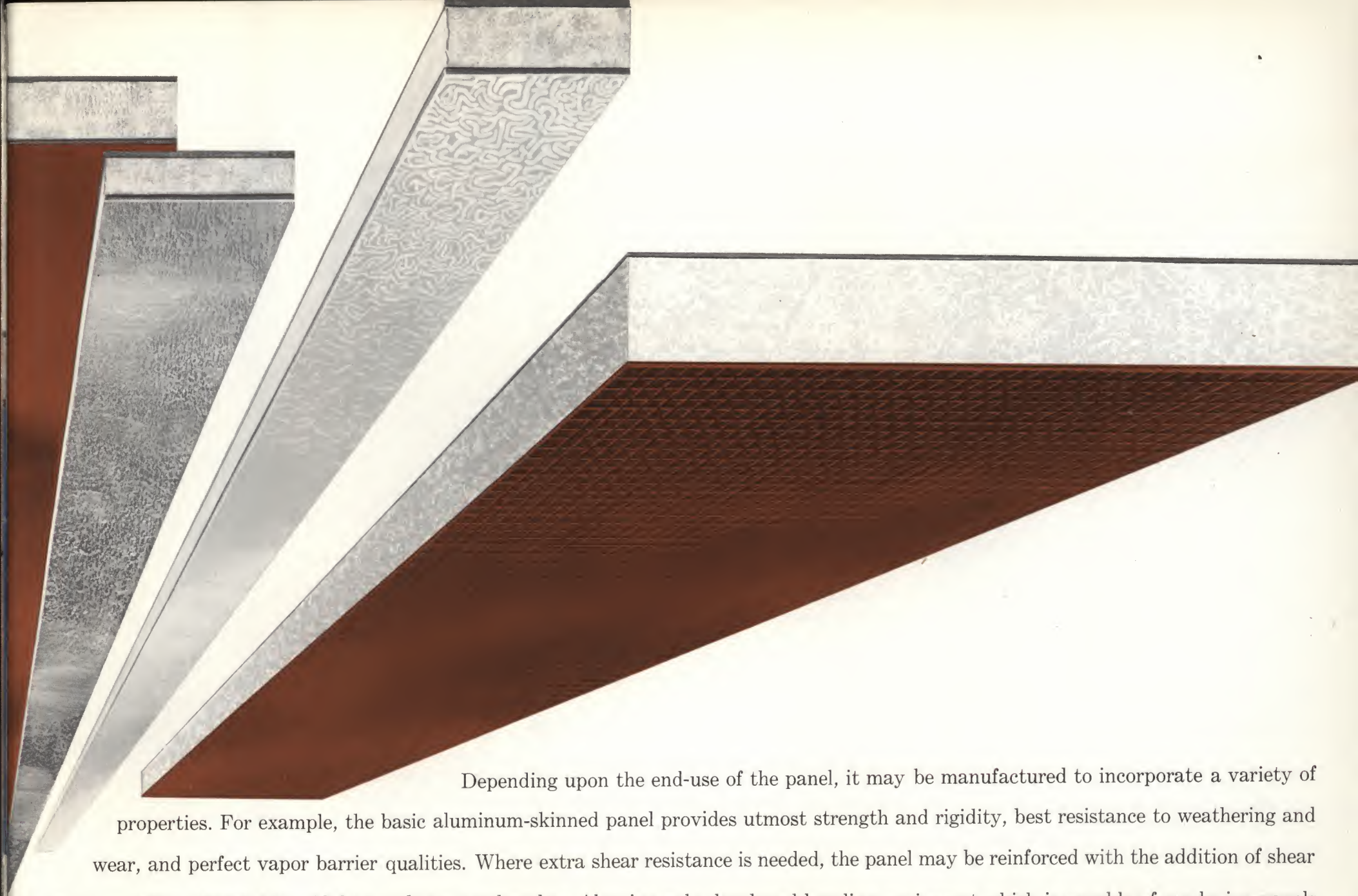
*Trademarks of Aluminum Company of America



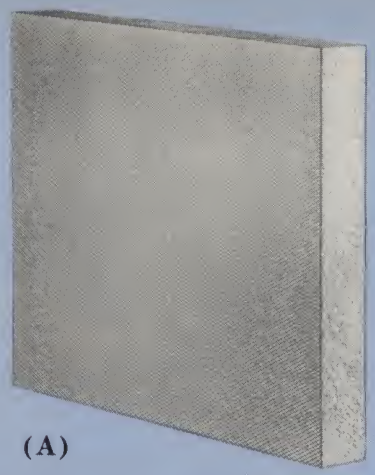
THIS IS ALPLY

Alcoa Alply panels are made of an expanded plastic core firmly bonded to aluminum facing sheets. Where desired, one of the aluminum facing sheets may be eliminated and a variety of materials bonded in its place, such as plywood, plasterboard, gypsum board or hardboard.

The shear-resistant core is opaque, moistureproof and odorless. It cannot support plant or animal life. Nominal core density of Alply panels is two pounds per cubic foot. The core is nonfriable, dimensionally stable and possesses self-extinguishing characteristics.



Depending upon the end-use of the panel, it may be manufactured to incorporate a variety of properties. For example, the basic aluminum-skinned panel provides utmost strength and rigidity, best resistance to weathering and wear, and perfect vapor barrier qualities. Where extra shear resistance is needed, the panel may be reinforced with the addition of shear webs. **Sizes Available.** Alply panels are produced on Alcoa's newly developed bonding equipment which is capable of producing panels to maximum lengths of 18 ft, subject to limitations of facing material specified. Alply panels may be ordered in widths up to 60 in. Core thicknesses may vary from 1 to 6 in.



(A)

(B)

(C)

FIGURE 1

TYPES

OF ALCOA ALPLY PANELS AVAILABLE

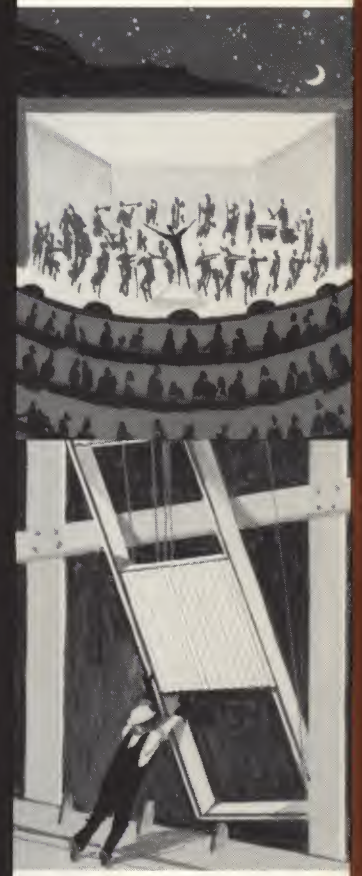
There are three basic types of Alply panels, each available with variations in facing, backup, thickness and size. In all types the exterior is plain or patterned aluminum sheet with a core of foamed polystyrene and an interior facing of various materials. Because all components are laminated into integral units, any panel can be cut with standard tools and procedures. "Raw-edged" panels described under (A) and (B) are most economical.

(A) Panels with aluminum facing bonded directly to the polystyrene core are the basic type. With these panels, dent resistance depends entirely on the combination of aluminum and plastic. Where dent resistance is important, .032 in.-thick aluminum is the recommended minimum. For applications where denting is a hazard, a higher strength alloy and thicker sheet are advisable. Panels of this type with aluminum facing on both sides are the most versatile. They are the lightest in weight and are available in the widest range of sizes.

(B) Panels with aluminum facing bonded to a backup material, which in turn is bonded to the plastic core, are the type recommended where very high dent resistance is required. A minimum aluminum thickness of .025 in. is generally recommended where a backup is used. Heavier aluminum facings may be required for large panels or where even greater dent resistance is needed. Typical backup materials are tempered hardboard, sanded cement-asbestos board or plywood.

(C) Specially edged or reinforced panels for joining or higher load-carrying purposes are available in either of the other two Alply types. Such panels may include edges formed from the aluminum facing, applied edge members, and built-in rails or shear webs of aluminum, wood or other materials. Panels in this category are produced to meet particular applications and are subject to special inquiry.

INTERIOR FACINGS within each of the Alply panel types are variable. They may be aluminum (with or without backup), hardboard, cement-asbestos board, plastic laminates or plywood. Although the polystyrene core has a high resistance to vapor transmission, as an added safeguard Alply panels are normally provided with an aluminum foil vapor barrier on permeable interior facings.



ALCOA

ALPLY...

THE IDEAL

BUILDING

MATERIAL

Alply panels offer an excellent method for construction of complete wall and roof systems. Color, pattern, insulation and desired interior facings are built into the panels *before* construction begins. Alply panels provide in a single unit a fast, low-cost system of construction that eliminates conventional framing, sheathing, siding, plastering, painting and decorating. Thus, Alply may be a prefabricated, self-insulating unit of wall or roof, completely finished from inside to outside.

Possessing excellent strength and insulation properties, these panels lend themselves to all types of uses where solid, flat, structural or decorative panels are needed. They can be used to fill the openings of a structural framework on a wall or roof, or as primary load-carrying roof-ceiling panels and bearing wall panels in one-story buildings. The wide variety of finishes and materials allows practically any desired decorative effect.

Among the foremost Alply advantages is its high strength-weight ratio. A typical 3-in. Alply panel, 4 ft by 8 ft with 0.025-in. aluminum facings weighs only 39 lb. Yet this panel can support a distributed load of 1,500 lb over an 8-ft clear span.

For curtain walls, Alply panels make excellent inserts in grid systems or can be used to span from floor to floor. They are available in widths, thicknesses and insulation values especially suited for this use.

On small buildings the panels can be used with post and beam construction, or they can be completely load carrying with no auxiliary structural members. Where considerable beam strength is required, in such applications as moderate or long-span roof paneling, the core is reinforced with longitudinal rails or shear webs of aluminum or nonheat-conductive materials.

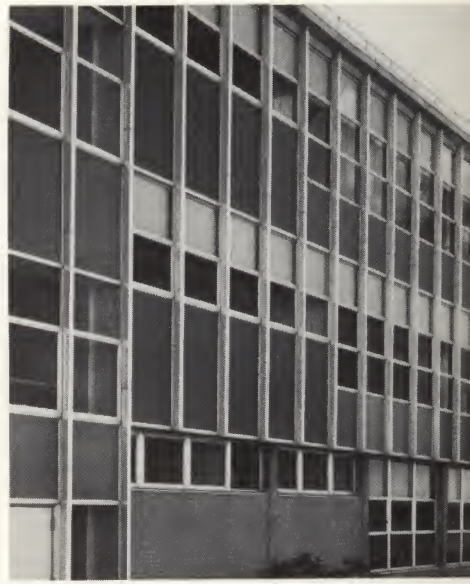
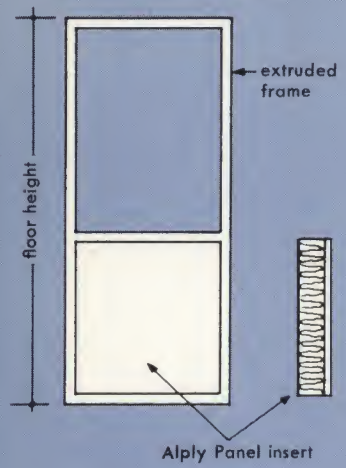
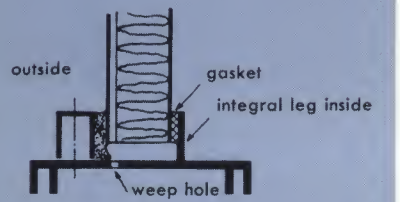


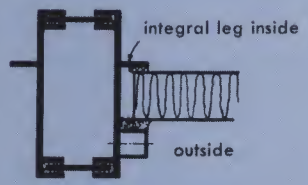
FIGURE 2

Typical Alply Details For Grid Walls

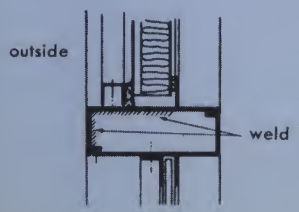




VERTICAL SECTION AT PANEL SILL



HORIZONTAL SECTION AT PANEL MULLION



VERTICAL SECTION AT JOINT BETWEEN MULLION AND HORIZONTAL MEMBER

Selection of Aluminum Facings

Alloys for all types of Alply panels are selected partly on a basis of dent resistance and partly because of the finish desired. Those shown in the table are most commonly employed for Alply building panels.

PLAIN or PATTERNED SHEET FACINGS	FINISH DESIRED (see also pages 21-23)			
	MILL FINISH or ALUMALURE	PORCELAIN ENAMEL	ALCOA ARCHITECTURAL COLOR	NATURAL ALUMILITE or DECORATIVE COLOR
HIGHER DENT-RESISTANT SHEET	3004 Alclad 3004	Alcoa No. 1 Porcelain Enameling Sheet	Alcoa Anoclad Sheet Type 10—Appearance match with Alcoa Anoclad Extrusions Type 10 in Alcoa Architectural Colors, 10 series.①④ Alcoa Anoclad Sheet Type 20—Appearance match with Alcoa Anoclad Extrusions Type 20 in Alcoa Architectural Colors, 20 series.②④ Alcoa Anoclad Sheet Type 30—Appearance match with Alcoa Anoclad Extrusions Type 30 in Alcoa Architectural Gray 2030.④ Alcoa Anoclad Sheet Type 40—Appearance match with Alcoa Anoclad Extrusions Type 40 in Alcoa Architectural Colors, 40 series.③④	No. 32 Alumilite* Sheet④
REGULAR-DUTY SHEET	3003 Alclad 3003	Alcoa No. 1 Porcelain Enameling Sheet Alcoa No. 3 Porcelain Enameling Sheet⑤		

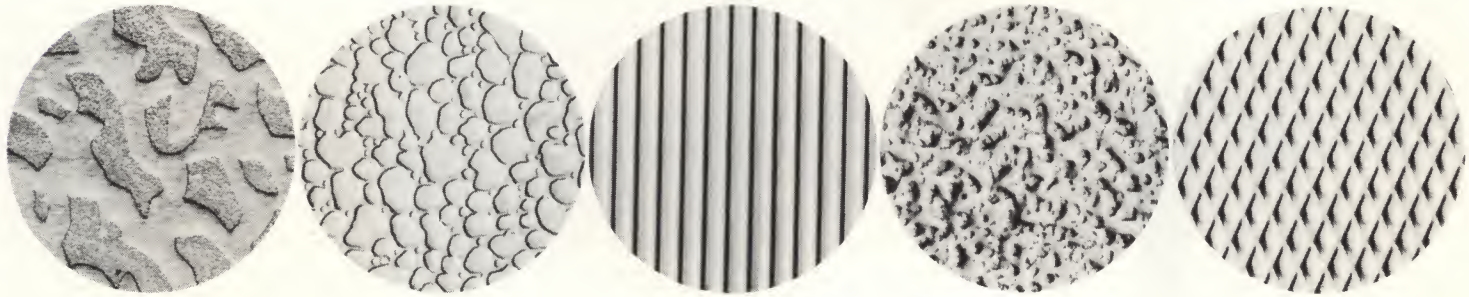
NOTE: The hardest workable temper should be specified for Alply facings.

*Trade Name of Aluminum Company of America

① 10 Series—Alcoa Arch. Gray 2010, Gold 4010.
② 20 Series—Alcoa Arch. Gray 2020, Blue 3120, Brown 4120, Green 6020.
③ 40 Series—Alcoa Arch. Gray 2140, Blue 3140, Brown 4040, Green 6040.
④ These alloys should not be selected if grinding, belt sanding or other types of mechanical finishing are specified.
⑤ Properties approach those of alloy 3003-O after enameling process; should be used only if it meets structural requirements.

Typical Patterned Sheet Facing

Other patterns are shown in the book Alcoa Aluminum Patterned Sheet.



Pattern No. 1 | Pattern No. 3 | Pattern No. 10 | Pattern No. E-5 | Pattern No. E-13

NOTE: When cleaning sealant compounds from raw-edged types of panels on grid wall installations, care should be taken not to destroy the plastic insulation at the panel edge with solvents that attack polystyrene. For removing materials other than sealant from panel facing, follow instructions in Alcoa's book, *Cleaning and Maintenance*.

Alply for Post and Beam Construction

The post and beam type of construction offers the greatest flexibility of design. Here, Alply panels are simply set in place in prepared frames. Wall panels in this use bear wind loadings only.

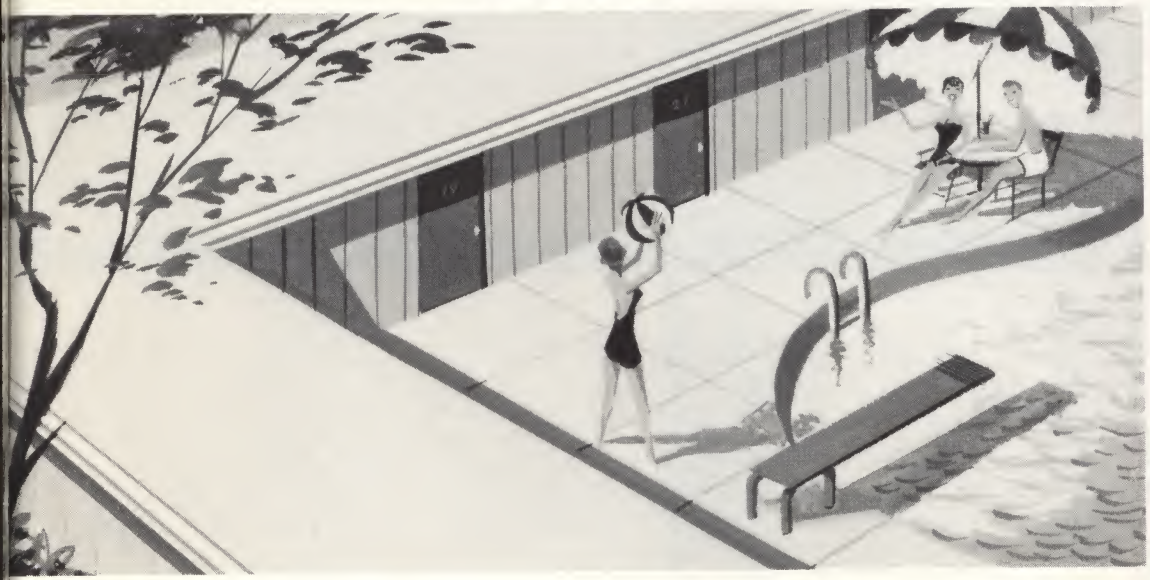
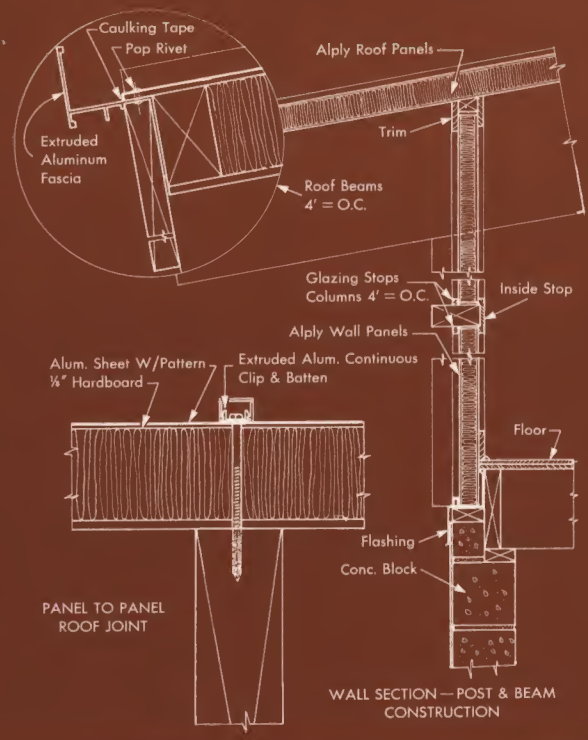


FIGURE 3



Alply as a Load-Bearing Panel

In load-bearing types of construction, the wall panels support the full roof loads as columns. The panels also serve as lintels over windows and door openings.

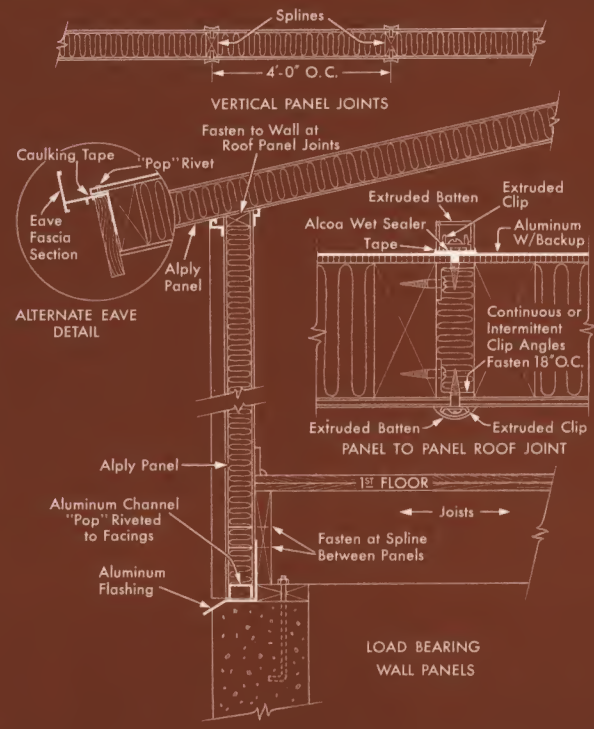
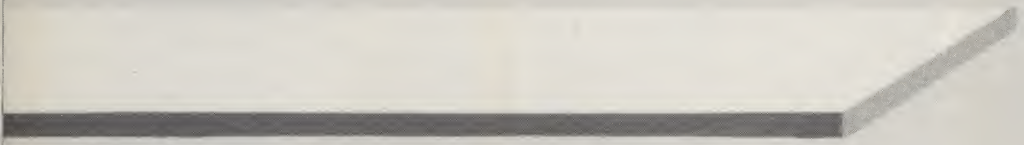


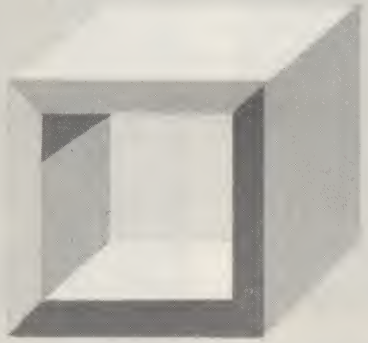
FIGURE 4

FIGURE 5



Original Flat Solid ALPLY Panel

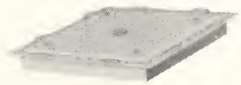
Same Panel Cut and Mitered

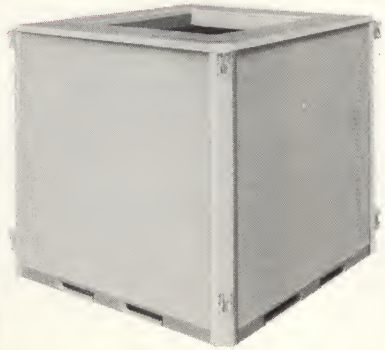


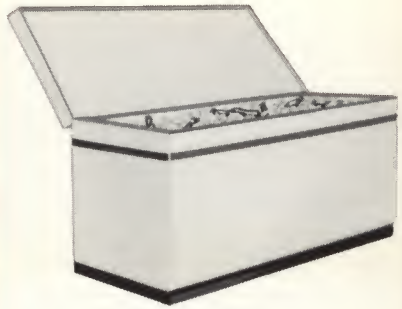
An Alply panel, cut and mitered, then folded, requires but one joint to close in the four sides. A suitable back panel and door complete the box.

PLY

THE NEW, LOW-COST MATERIAL FOR THE REFRIGERATION, TRANSPORTATION AND MARINE INDUSTRIES



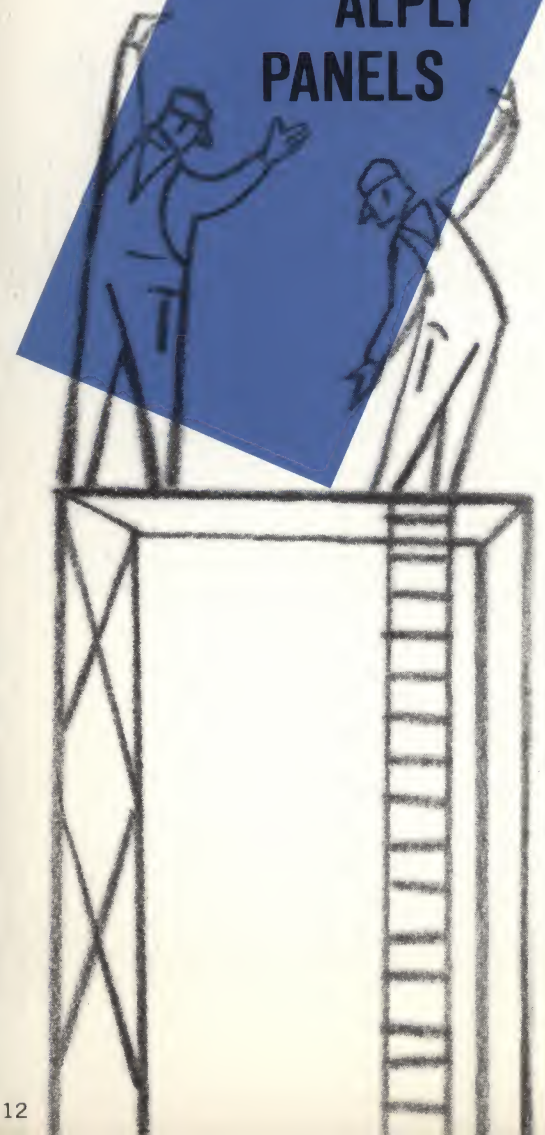




Alcoa Alply Panels Can Be Applied Economically to Many Uses

Band Shells
Ceilings
Controlled-Temperature Rooms
Containerization Units
Curtain Walls
Doors
Folding Partitions and Doors
Frozen Food Display Cases
Garage Doors
Incubator Doors and Cabinets
Load-Bearing Walls
Mobile Camping Units
Mobile Homes
Movable Partitions
Portable Buildings
Portable Coolers
Refrigerator Cabinets
Refrigerated Dispensing Units
Refrigerated Truck and Trailer Bodies
Roofs With Applied Covering
Roofs With Integral Covering
Service Stations
Table Tops

SUGGESTED METHODS OF JOINING ALPLY PANELS



The speed and ease inherent in Alply panel construction are strikingly demonstrated through the simple and efficient joining techniques employed. For example, panels may be inserted, sealed or gasketed just as plate glass is installed. These joining methods require no special edge preparation and, if necessary, panels may be trimmed in the field. Other types of joints employ splines, battens and other fixtures. One or more of these methods will provide adequate joints for most applications.

All joining methods shown protect panel edges from exposure. For some applications, it may be preferable to enclose and protect panel edges with extruded aluminum shapes or channels. The particular joining method chosen is primarily governed by such considerations as degree of insulating efficiency required, expansion, building tolerances, resistance to air-moisture leakage and erection sequence of panels.

Alply's versatility and unique workability can be used to completely avoid exterior corner joints. A 4-ft by 8-ft Alply panel can be mitered and folded to form a corner panel 8 ft long by 2 ft wide on each side. The exposed sides are then joined as other panels are.

PANEL-TO-PANEL JOINTS

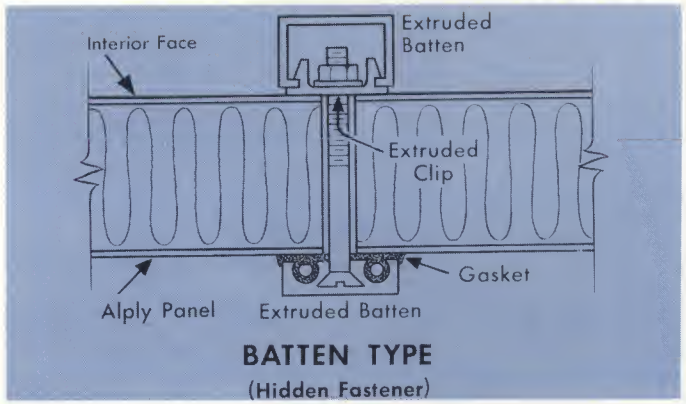


FIGURE 6

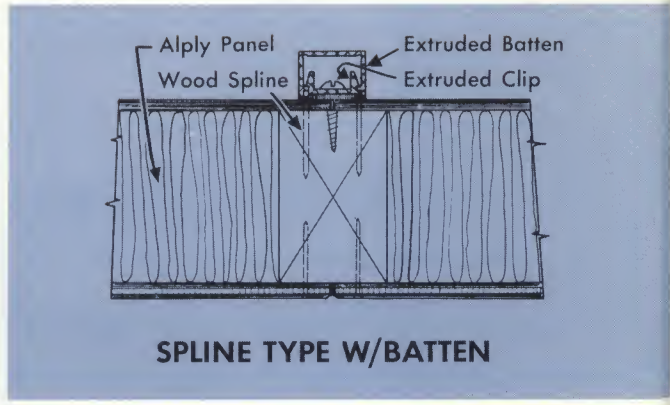


FIGURE 8

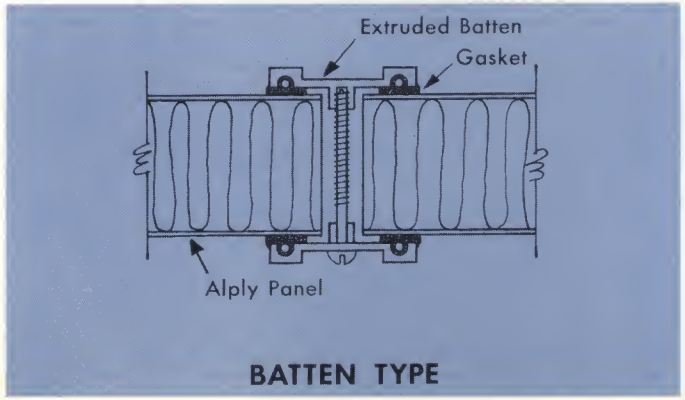


FIGURE 7

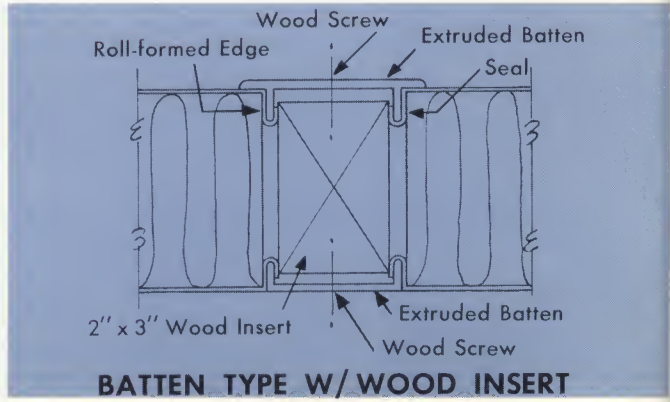


FIGURE 9

Patent Pending

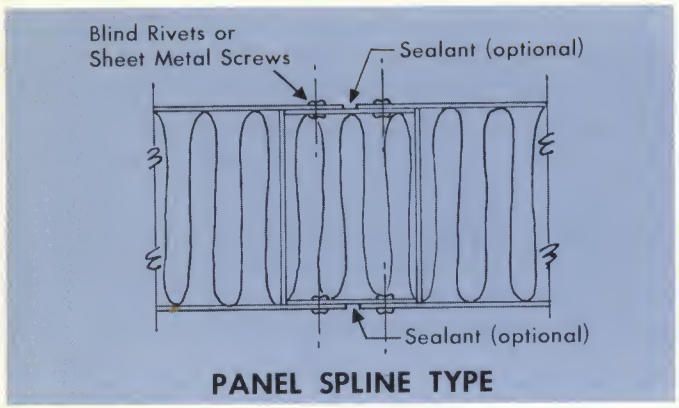


FIGURE 10

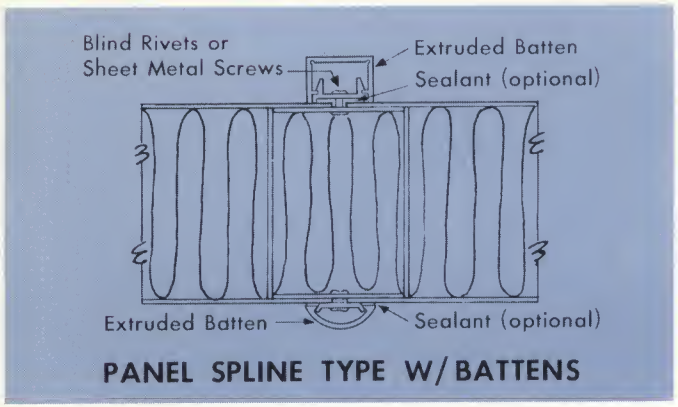


FIGURE 11

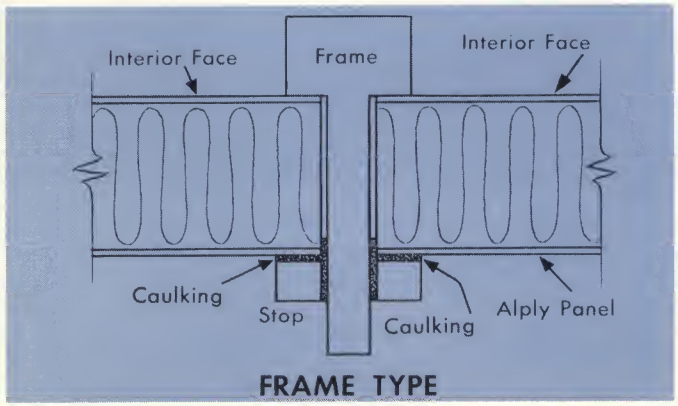


FIGURE 12

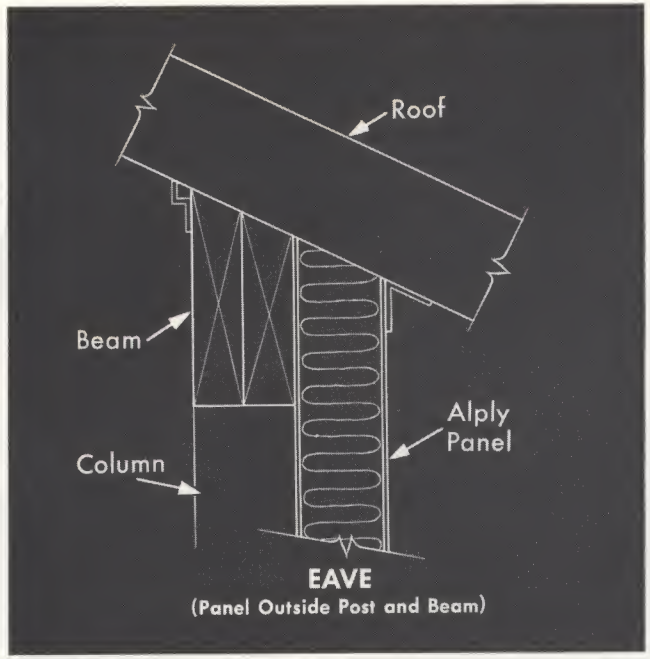


FIGURE 13

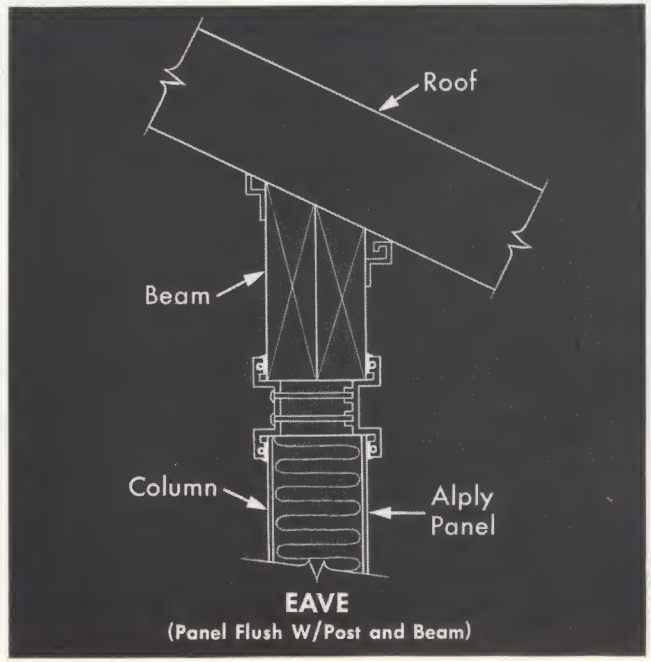


FIGURE 14

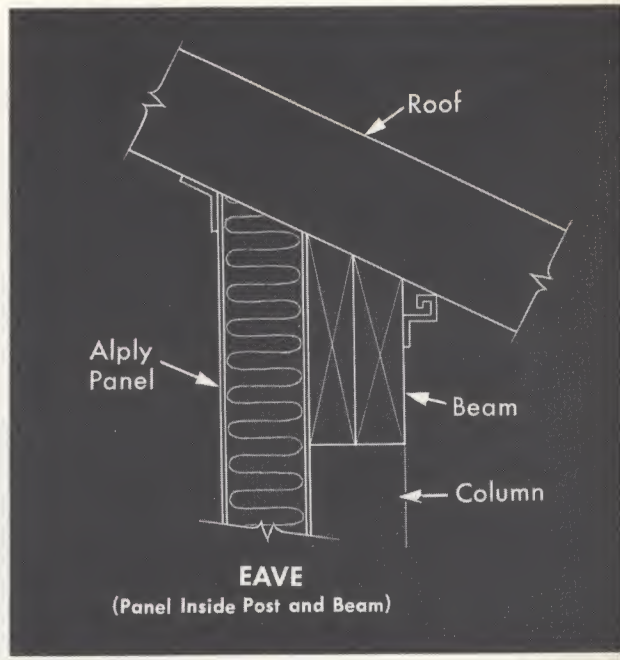


FIGURE 15

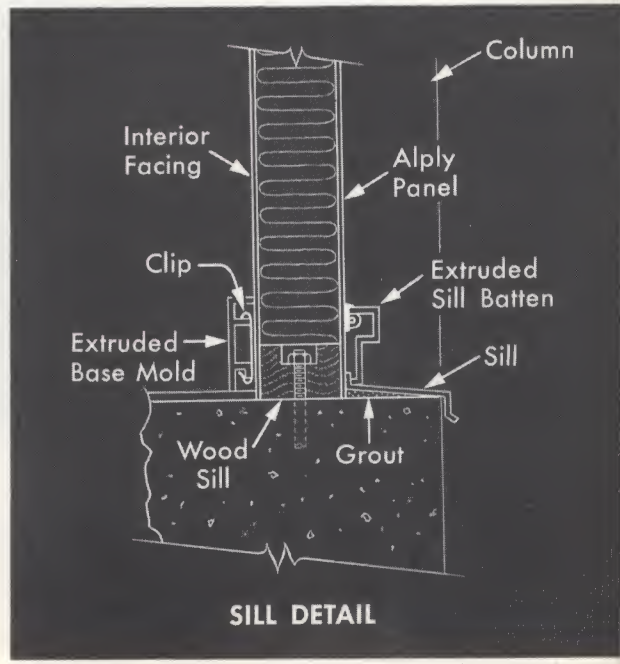


FIGURE 16

TESTS AT LEADING UNIVERSITY PROVE ALPLY'S SUPERIOR PERFORMANCE UNDER SEVERE CONDITIONS

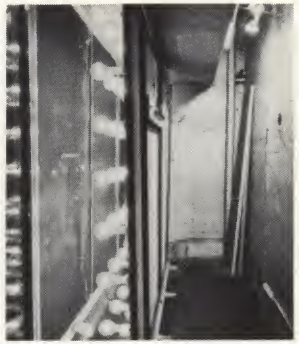
Alply Panel Structure at The Pennsylvania State University Meets Challenge of Accelerated, Extreme Exposure and Temperature Changes

To evaluate Alply panel's performance, a 9-ft by 18-ft test structure was erected at The Pennsylvania State University. The full-size mock-up included Alply panel wall and roof components, aluminum structural frame, double-glazed windows and a variety of framing and joining techniques. Wall and roof panels were 3 in. and 4 in. thick, respectively. Exterior edges of the aluminum roofing face were turned up to form battens on 4-ft centers.

Outside facings of panels tested included 0.032-in. aluminum bonded to ⅛-in. and 3/16-in. cement-asbestos board and aluminum facing bonded directly to the core. Inside facings consisted of ¼-in. plywood and 0.032-in. aluminum bonded to cement-asbestos board.

The three test programs used in the evaluation of Alply were: (1) cyclic temperature and water spray, (2) static pressure differential and water spray and (3) extreme temperature conditions.

Inside View of Test Structure. Visible are some of the more than 250 thermocouples attached to columns, lintels, windows and other parts of the structure. The lead wires from these thermocouples terminate in a temperature-recording device from which readings were taken during the various phases of the cyclic and extreme temperature tests.



Exterior View. The heat lamps shown are used to raise outside panel temperatures to 150°F. Aluminum facing sheets are painted black to absorb heat more rapidly and increase speed of temperature cycles.

TECHNICAL DATA

CYCLIC TEMPERATURE AND WATER SPRAY TEST

This test comprised a series of 20 extreme temperature cycles on the outside facings. Temperature inside the test structure was maintained at a constant 75°F. In each cycle, average external surface temperature went as high as 150°F and as low as 0°F. Each cycle consisted of four phases. In the first three phases, panels were alternately heated to 150°F, then rapidly cooled by water spray to 60°F. In the fourth phase, panel temperature was lowered to 0°F.

The Tests Proved Conclusively that Alply panels were capable of withstanding extreme temperature cycling. Recorded data also showed that the amount of wall panel deflection was on the order of the length of the panel divided by 300 for a temperature difference of 100°F.

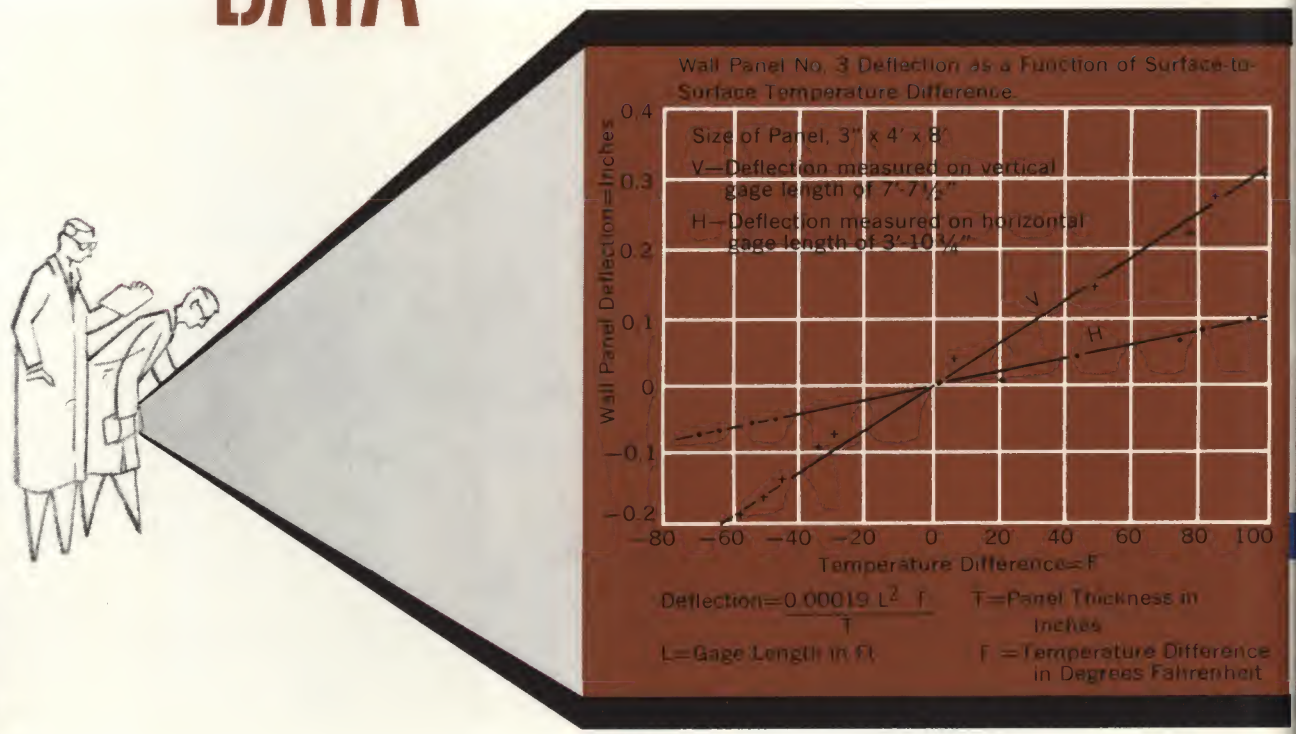


FIGURE 17

Deflection varies with panel thickness, length of panel and temperature difference of inside and outside surfaces. These deflections may be calculated with the empirical formula included in Fig. 17.

STATIC PRESSURE DIFFERENTIAL AND WATER SPRAY TEST

At random intervals throughout the cyclic test program, a static pressure differential of up to 1.7 in. of water, or the equivalent of a 60-mph wind, was brought to bear on the test unit. The interior was held at negative pressure. Pressure applied in conjunction with the water spray to simulate wind-driven rain provided an effective measure of joint-sealing efficiency.

Final Test Results Showed Good All-Round Joint Performance. Joints included in the tests were: the return edge and plug, batten, spline types and several taped joints.

EVALUATION OF INSULATING PROPERTIES

Insulating properties of Alply panels were found to be outstanding. During a steady-state test in which outside air temperature was lowered to −20°F and held constant for 5 hours, the interior air temperature was held at a constant 75°F, relative humidity at 31 per cent. Although the outside surface temperature of a typical 3-in. wall panel went as low as −11°F, the inside panel surfaces never dropped below 69°F.

During this test, vertical joints were observed to be completely free of condensation, except where they join the sill as shown in photo.

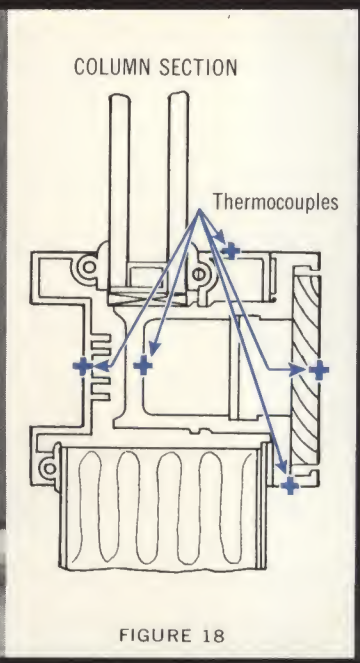


FIGURE 18

Effects of Severe Test Conditions Where Through Conductance Existed. Frost and a low inside surface temperature of 23°F were encountered when bottoms of the columns were set directly into the aluminum sill and through conductance was not broken. The test emphasized the importance of proper joint design. As shown here, through conductance was effectively broken by a ¼-in. air space and there was no frost.

Aluminum Columns Used for Structural Frame. Cross section shows panel and glass on either side and location of thermocouples.

Test Procedure. Panels of different construction, 2 and 4 in. thick, were subjected to water vapor transmission tests. Test conditions for the 4-in. panels were: −20°F outside air; 80°F inside air; relative inside humidity, 75 per cent. The 2-in. panels were tested under the same conditions with the exception of the relative humidity which was held at 40 per cent. Panels were weighed at beginning and at end of 6-week test period to determine amount of water pickup.

WATER VAPOR TRANSMISSION TEST

Test Panels Used in Water Vapor Transmission Test

Total amount of water pickup varied with the permeability of the interior or warm-side facing. Variations in water pickup emphasize the excellent characteristics of the aluminum facings. The foam core itself exhibited very little water pickup. Condensation on the foil tape edge seal and absorption by the gypsum board contributed to relatively high moisture content of Panel 4B.

Panel 3B—Aluminum exterior facing backed with ⅛-in. cement-asbestos board. ⅛-in. hardboard interior facing. Moisture accumulation, 0.36 lb.

Panel 4B—Aluminum exterior facing with gypsum board interior facing. Moisture accumulation, 1.06 lb.

Panel 11B—Aluminum exterior and interior facing. Moisture accumulation, 0.04 lb.

Panel 12B—Aluminum exterior facing with perforated aluminum interior facing. Moisture accumulation, 0.42 lb.

THERMAL CHARACTERISTICS OF ALPLY

Since no structural material is completely impervious to the flow of heat, accurate determination of thermal characteristics of enclosing walls is necessary for the design of efficient heating and cooling systems in buildings or commercial equipment. Proper selection of materials minimizes flow of heat through walls, floors and ceilings.

Over-all heat flow through wall sections composed of several panels is affected by the type of joint used between panels. Where condensation problems might arise, highly thermal-resistant joints keep warm-side panel temperatures above the dew point temperature of surrounding air to prevent condensation.

The "U" values in the following tables and graph are calculated on the basis of a k value of 0.25 (*k value based on results of Hot Plate Tests at Penn State University*).

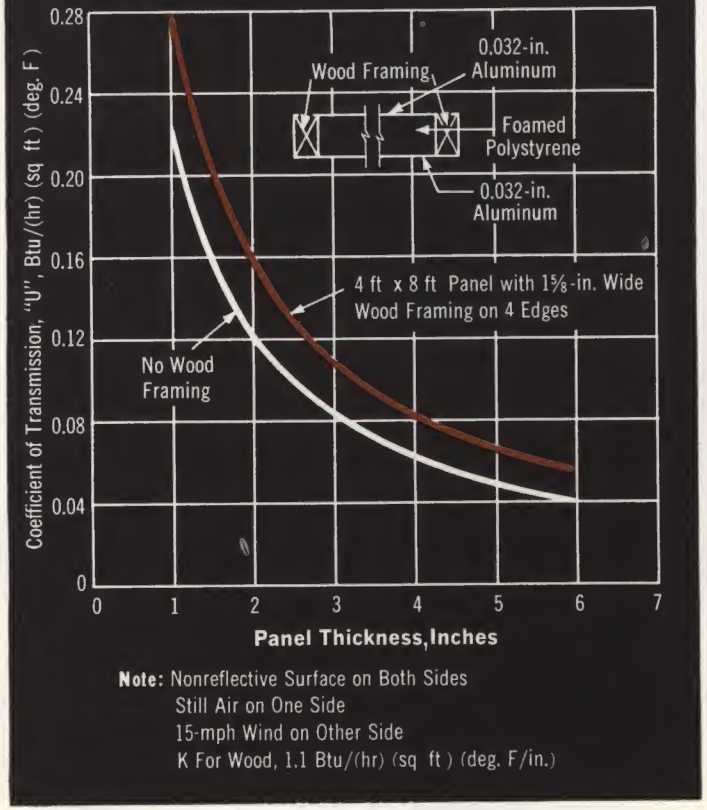
"U" VALUES OF TYPICAL SANDWICH PANEL CONSTRUCTION WITH NONREFLECTIVE SURFACES, STILL AIR INSIDE AND 15-MPH WIND OUTSIDE

Type of Panel	Over-All Panel Thickness, Inches					
	1	2	3	4	5	6
.032 in. Aluminum / oamed Polystyrene / .032 in. Aluminum	0.218	0.116	0.079	0.060	0.049	0.041
.032 in. Aluminum / oamed Polystyrene / ⅛ in. Plywood	0.248	0.124	0.083	0.062	0.050	0.042
.032 in. Aluminum And ⅛ in. Hardboard / oamed Polystyrene / .032 in. Aluminum	0.239	0.122	0.082	0.062	0.050	0.042
.032 in. Aluminum And ⅛ in. Hardboard / oamed Polystyrene / ⅛ in. Hardboard And .032 in. Aluminum	0.265	0.129	0.085	0.063	0.051	0.042
.032 in. Aluminum And ⅛ in. Hardboard / oamed Polystyrene / ¼ in. Plywood	0.276	0.131	0.086	0.064	0.051	0.042

NOTES: 1. "U" values are expressed as Btu/(hr) (sq ft) (deg. F)
2. These "U" values were calculated using thermal resistance data for air surfaces and skin materials obtained from the 1957 ASHAE Guide.
3. A thermal conductivity of 0.25 Btu/(hr) (sq ft) (deg. F/in.) was used for foamed polystyrene.

TABLE 1

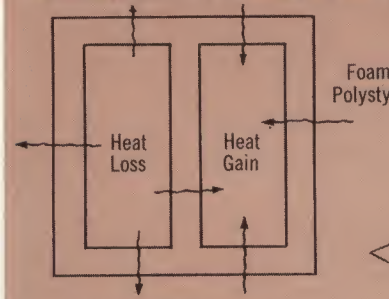
EFFECT OF WOOD FRAMING ON "U" VALUES OF A TYPICAL ALUMINUM SANDWICH PANEL



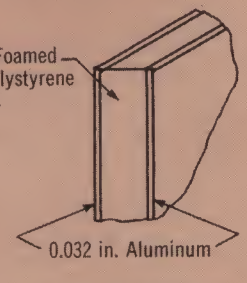
Note: Nonreflective Surface on Both Sides
Still Air on One Side
15-mph Wind on Other Side
K For Wood, 1.1 Btu/(hr) (sq ft) (deg. F/in.)

FIGURE 19

"U" VALUES FOR UPWARD, HORIZONTAL AND DOWNWARD HEAT FLOW FOR A TYPICAL SANDWICH PANEL CONSTRUCTION WITH REFLECTIVE SURFACES, AND STILL AIR ON BOTH SIDES



Heat Flow Directions



Panel Construction

Direction of Heat Flow	Over-All Panel Thickness, Inches					
	1	2	3	4	5	6
Upward	0.156	0.096	0.070	0.054	0.045	0.038
Horizontal	0.140	0.090	0.066	0.052	0.043	0.037
Downward	0.078	0.059	0.048	0.040	0.035	0.030

NOTES: 1. "U" values are expressed as Btu/(hr) (sq ft) (deg. F)
2. These "U" values were calculated using thermal resistance data for air surfaces and skin materials obtained from the 1957 ASHAE Guide.
3. A thermal conductivity of 0.25 Btu/(hr) (sq ft) (deg. F/in.) was used for foamed polystyrene.

TABLE 2

RESISTANCE

TO CORROSION OF ALPLY

The most remarkable feature about aluminum facing on Alply Panels is its durability and long life in outdoor applications. Aluminum's resistance to weather and to corrosive industrial and seacoast atmospheres has been proven in thousands of tests and installations throughout the world.

The charts below record the amount of weather penetration into unfinished aluminum at representative locations. For example, after 20 years' exposure to the seacoast atmosphere at La Jolla, Calif., the average depth of weather-produced pits in aluminum was 4.1 mils (less than one-sixth of the thickness of .025 in.-thick aluminum sheet), while the occasional maximum depth was only 12 mils. In New York City's industrial atmosphere, the maximum depth of attack after 20 years was only 7.4 mils. Aluminum characteristically weathers by pitting, so there is little actual loss of metal. Therefore, even after 20 years, plenty of structurally sound aluminum remains to assure continued life of the installation.

Alply Panels are available with a wide variety of decorative finishes on the aluminum facings. Several of the finishes, including some very low cost ones, show exceptional durability in outdoor exposure. These finishes owe much of their long life to the inherent corrosion resistance of the aluminum to which they are applied. Thus, in many cases, finishes give far better performance on aluminum than they do on other construction materials. For information on finishes, see pages 21 and 22.

FIGURE 20

aluminum weather resistance charts

The charts are based on data gathered from test specimens and from installations in service up to 52 years when inspected.

AVERAGE DEPTH OF ATTACK: An average of all weather penetration into the aluminum surface.

MAXIMUM DEPTH OF ATTACK: The deepest weathering that occurred.

EXPOSURE TIMES: 20 years for test specimens; 52 years for oldest installation when inspected.

TYPICAL ATMOSPHERES TESTED: Seacoast—Point Judith, R. I.
Industrial—New Kensington, Pa.

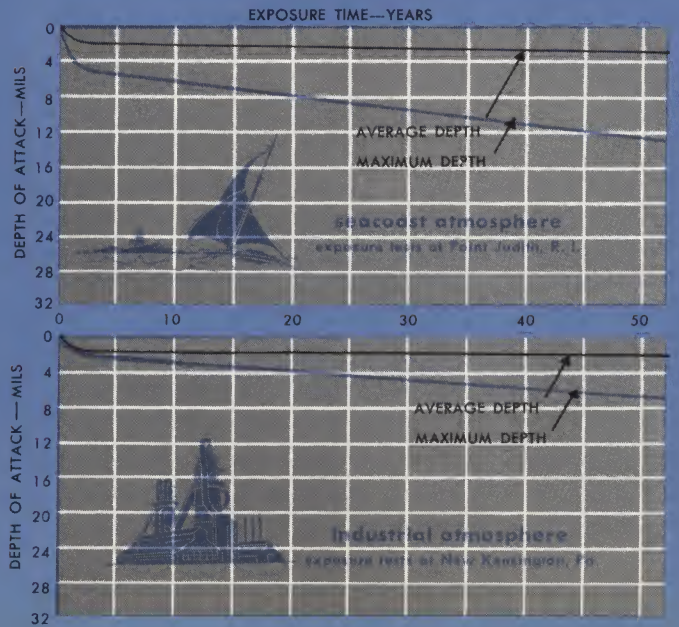


TABLE 3

resistance of aluminum to typical atmospheric conditions

The map shows how a few of the thousands of specimens tested correspond to the weathering curves on the charts above.

LOCATION	TYPE ATMOSPHERE	TYPE SAMPLE	EXPOSURE TIME	DEPTH OF ATTACK MILS	
				AVERAGE	MAXIMUM
1 La Jolla, Cal.	Seacoast	Test	20 years	4.1	12.0
2 Phoenix, Ariz.	Rural	Test	20 years	0.3	0.6
3 Point Comfort, Texas	Seacoast	Test	4 years	2.0	3.4
4 Freeport, Texas	Seacoast	Test	4 years	1.8	3.7
5 Key West, Fla.	Seacoast	Test	20 years	1.4	4.8
6 Copperhill, Tenn.	Industrial	Test	4 years	1.1	5.1
7 New Kensington, Pa.	Industrial	Flashing	11 years	2.1	2.9
		Fence Clip	25 years	3.7	5.8
8 Altoona, Pa.	Industrial	Test	20 years	3.6	9.3
9 State College, Pa.	Rural	Test	20 years	1.2	2.9
10 Sandy Hook, N. J.	Seacoast	Test	20 years	2.6	6.2
11 New York City, N. Y.	Industrial	Test	20 years	2.8	7.4

STRENGTH

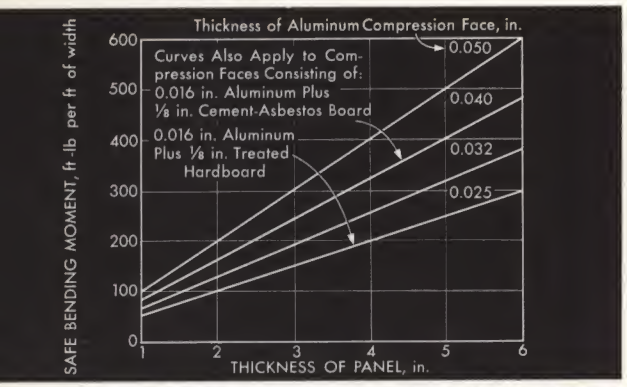


Fig. 21. SAFE BENDING MOMENT IN ALCOA ALPLY PANELS (Values in this figure are for applications not involving elevated temperature. For effects of elevated temperature, see Fig. 23.)

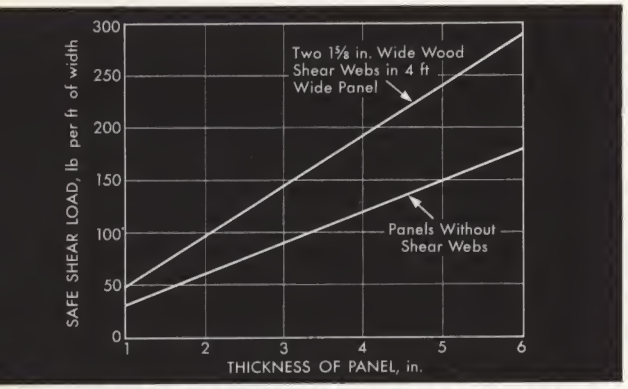


Fig. 22. SAFE TRANSVERSE SHEAR IN ALCOA ALPLY PANELS (Values in this figure are for applications not involving elevated temperature. For effects of elevated temperature, see Figure 23.)

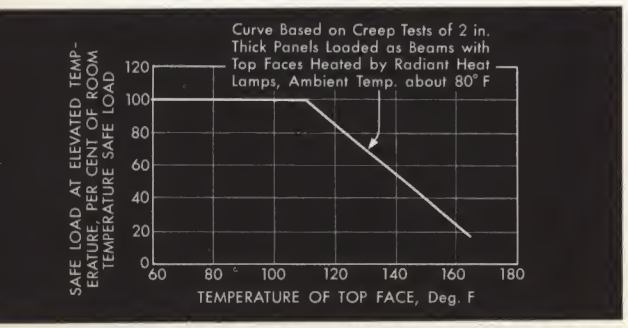


Fig. 23. EFFECT OF ELEVATED TEMPERATURE ON SAFE LOADS

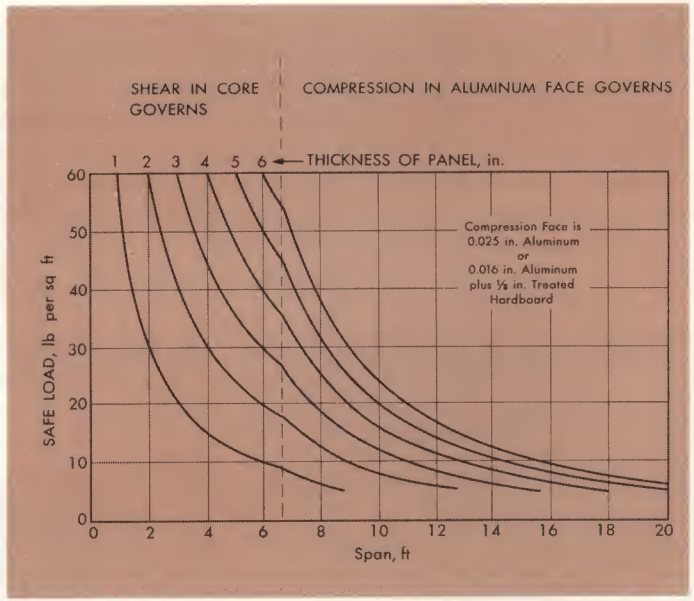


FIGURE 24

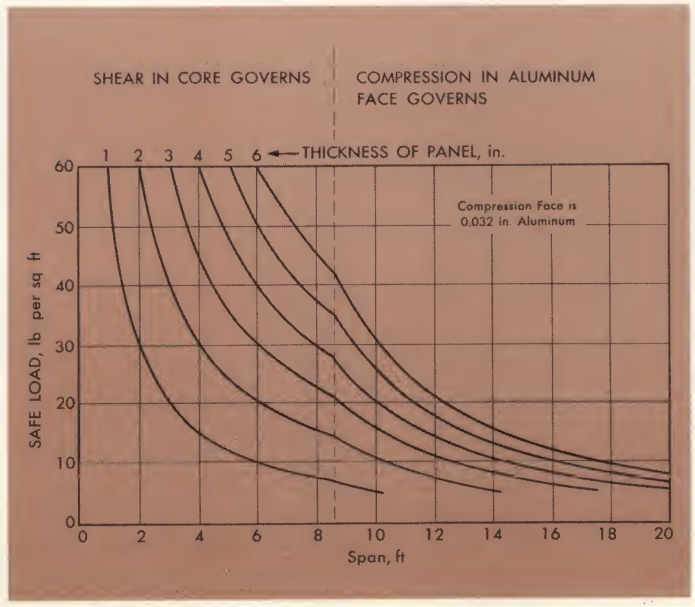


FIGURE 25

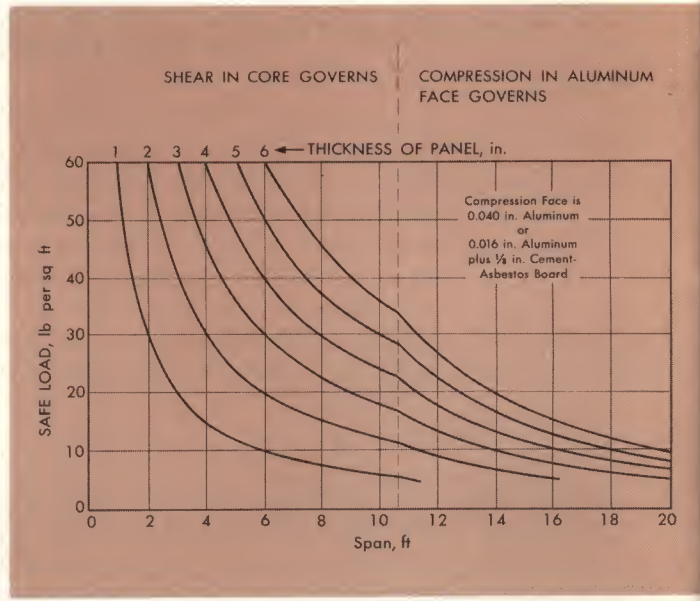


FIGURE 26

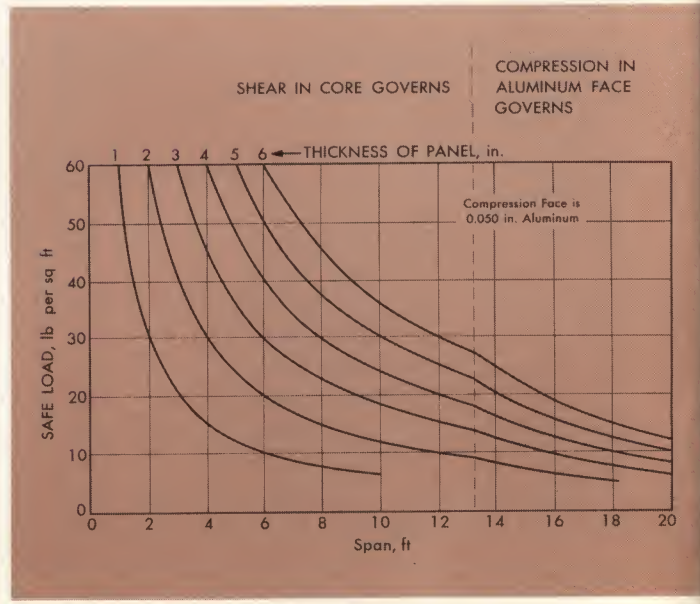


FIGURE 27

SAFE UNIFORM LOADS ON ALCOA ALPLY PANELS LOADED AS SIMPLE BEAMS (Values in these figures are for applications not involving elevated temperature. For effects of elevated temperature, see Figure 23.)

PROPERTIES OF ALPLY

Alply panels are considered as I-beams in determining strength properties. Transverse bending is resisted by the faces or "flanges," and transverse shear is assumed to be resisted entirely by the core or "web." Tension, compression or shear loads in the plane of the panel are considered to be carried entirely by the faces.

The strength of Alcoa Alply panels is generally limited by either the shear strength of the core or the local buckling strength of the compression face. Except for long columns whose strength is limited by column buckling, local buckling also governs strength of panels loaded in edge compression.

The safe-load tables shown here are based on these values:

WORKING STRESSES FOR APPLICATIONS NOT INVOLVING ELEVATED TEMPERATURES (FOR EFFECT OF ELEVATED TEMPERATURES, SEE FIG. 23)

Compression in Aluminum Face	2,000 psi
Shear in Core	2.5 psi
Shear in Wood Shear Web	60.0 psi

MODULI OF ELASTICITY

Modulus of Aluminum	10,000,000 psi
Modulus of Treated Hardboard	800,000 psi
Modulus of Cement-Asbestos Board	2,000,000 psi
Shear Modulus of Core	400 psi
Shear Modulus of Wood Shear Webs	50,000 psi

FACTOR OF SAFETY

Tests indicate that these working stresses provide factors of safety of at least 2.0 on the minimum compressive buckling strength of aluminum faces and at least 4.0 on the minimum shear strength of polystyrene foam cores. The latter factor of safety was selected to provide adequate protection against creep at working loads.

It is recommended that these working stresses and the corresponding safe loads be multiplied by four-thirds for loads produced by wind.

TABLE 4

DEFLECTION OF ALCOA ALPLY PANELS UNIFORMLY LOADED AS SIMPLE BEAMS

$$D = \frac{A\,(WL^4/d^2) + B\,(WL^2/d)}{1{,}000{,}000}$$

D = Deflection, in.
W = Uniform load, lb per sq ft
L = Span, ft
d = Thickness of panel, in.
A = Coefficient depending on faces (Average value for two differing faces is used for coefficient A)
B = Coefficient depending on core

Thickness of Aluminum Faces, in.	Values of Coefficient A
0.025[1]	15.0
0.032	11.7
0.040[2]	9.4
0.050	7.5

Description of Panel	Values of Coefficient B
Panels Without Shear Webs	312
Panels With Two 1⅝-in. Wide Wood Shear Webs in 4-ft Width of Panel	37

1. Also applies approximately to faces consisting of 0.016-in. aluminum plus ⅛-in. treated hardboard.
2. Also applies approximately to faces consisting of 0.016-in. aluminum plus ⅛-in. cement-asbestos board.

TABLE 5

SAFE VALUES OF EDGE COMPRESSIVE LOAD ON ALPLY PANELS[1]

Thickness of Aluminum Face, in. (Thickness of Thinner Face if Faces Differ)	Safe Load in Edge Compression, lb per ft[2]	Limiting Lengths in Feet, Above which Safe Loads Do Not Apply to Columns (Unloaded Edges Not Supported)[3]				
		d=2″	d=3″	d=4″	d=5″	d=6″
0.025[4]	900	9.7	15.6	21.5	27.3	33.2
0.032	1150	9.1	15.0	20.9	26.8	32.7
0.040[5]	1440	8.3	14.3	20.3	26.1	32.0
0.050	1800	7.2	13.4	19.4	25.3	31.2

1. Values in this table are for applications not involving elevated temperature. For effects of elevated temperature, see Figure 23.
2. Safe load values allow for eccentricity of load equal to 1/6 of panel thickness.
3. For panels supported on all four edges, the given values of safe load apply to any length of panel.
4. Also applies approximately to faces consisting of 0.016-in. aluminum plus ⅛-in. treated hardboard.
5. Also applies approximately to faces consisting of 0.016-in. aluminum plus ⅛-in. cement-asbestos board.

TABLE 6

SAFE VALUES OF BEARING STRESSES ON FACES[1]

Type of Load	Type of Face	Safe Bearing Stress, psi
Distributed load	Any	5
Concentrated load on 1-in. diameter circle or smaller area[2]	0.025-in. aluminum	80
	0.032-in. aluminum	100
	0.040-in. aluminum	125
	0.050-in. aluminum	150
	0.016-in. aluminum plus ⅛-in. hardboard	145
	0.016-in. aluminum plus ⅛-in. cement-asbestos board	200

1. Values in this table are for applications not involving elevated temperature. For effects of elevated temperature, see Figure 23.
2. Safe bearing stress values apply to faces of Alclad 3003-H16 or stronger alloys.

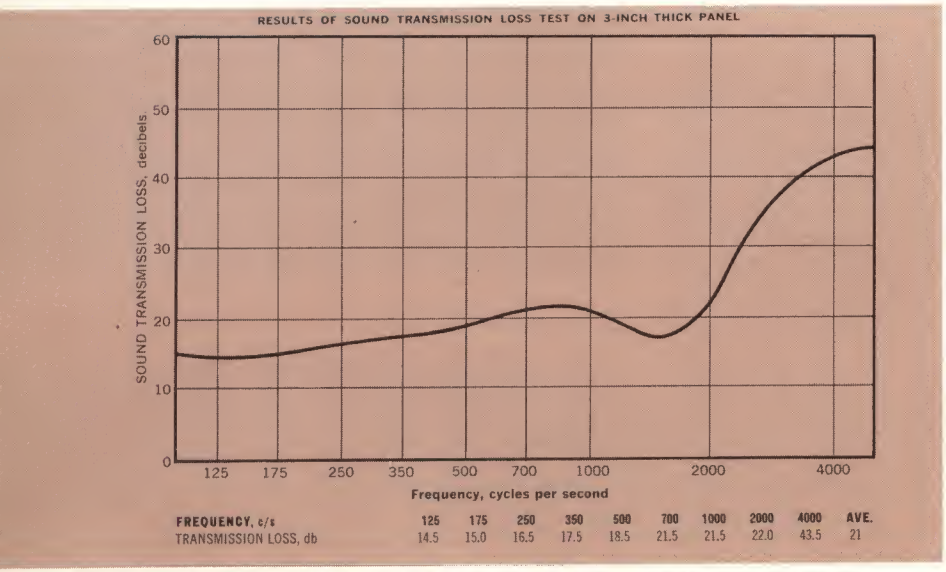
ACOUSTICAL

PROPERTIES OF ALPLY

Alcoa Alply's sound-absorption qualities vary with interior facing but are similar to those of conventional materials used for the inside finish of residential construction. A 3-in. Alply panel weighing about 1½ lb per sq ft shows a sound transmission loss of 21 decibels. This value may be adjusted either up or down by varying panel construction.

Its relatively high degree of sound reflectivity, together with its light weight and stiffness, can be put to good use in stage flats.

FIGURE 28



FREQUENCY, c/s	125	175	250	350	500	700	1000	2000	4000	AVE.
TRANSMISSION LOSS, db	14.5	15.0	16.5	17.5	18.5	21.5	21.5	22.0	43.5	21

Results of Sound Transmission Loss Test on 3 in. Thick Panel Conducted in Accordance with ASTM Std. E90-55 By Riverbank Acoustical Labs.

ALPLY PANEL

MANUFACTURING STANDARDS

Alply panel uniformity and quality are assured through exacting production techniques and established quality control procedures. Standard manufacturing tolerance for overall thickness is ±1/16 in.; length and width tolerances are held to ±1/8 in.

Panel squareness is governed by the type of facing sheet specified. However, trimmed panels may be ordered, subject to special inquiry, where the length of the diagonals does not vary more than 1/8 in. for a 4-ft by 8-ft panel. Length and width tolerances for trimmed panels may also be specified at ±1/16 in.

Smoothness of panel facings is dependent on the type of material bonded to the core. Flat aluminum facings are considered smooth if clearance is less than 0.015 in. along the course of a 6-in. rule. Hardboard, plywood and other materials shall be as specified by the facing manufacturer.

Flatness, defined as the clearance at the center of the panel when holding a straight edge along the entire length of the panel, will vary according to facings or combinations of facings used. In applications where temperature differences exist across the face of the panel, the panel will bow slightly with temperature change. Where moisture exists, slight bowing will also be encountered in panels having a combination of permeable and nonpermeable facings. As noted previously (page 14, Figure 17), panel bow is not critical for most applications unless unusually long panel lengths are being considered.

ALUMINUM FINISHES FOR ALPLY PANEL FACING

Aluminum responds to a wide variety of finishing processes that give it texture or color or both. This finish may be decorative or functional. And, as has been proven over the years in appliance, automotive and architectural applications, aluminum stays new looking without maintenance. Aluminum facing on Alply panels presents an impervious face to corrosive atmospheres and offers wide decorative possibilities.

Of the many aluminum finishes available, those most suitable for exterior and interior use on Alply are described on the following pages. Plastic and photographic laminate surfaces may also be used.

PLAIN MILL FINISH

This is the unfinished surface which naturally results from the sheet rolling process, varying slightly for different alloys and tempers. Weathering grays such metal uniformly, the degree of darkening depending upon location and the type of atmosphere present. Mill-finished sheet is the most economical aluminum facing for Alply.

PATTERNED SURFACES

Alcoa's many standard embossed aluminum patterned sheets, though not "finishes" in the true sense of the word, function as such and provide excellent facings for Alply panels. Embossed patterns soften reflections and assure attractive surfaces. Patterned sheet facing may be employed on Alply panels in a mill-finished condition or is available with Alumalure®, Alcoa Architectural Color or other finishes. (See patterns, page 8.)

CAUSTIC ETCH or FROSTED FINISH

This low-cost, chemically produced matte surface gives aluminum facing the appearance of finely etched glass. Etched surfaces are subject to handling marks and should receive a lacquer coating or Alumilite finish immediately after etching. Caustic etch is specified by the symbol, R1.

NATURAL-COLOR ALUMILITE

This is a hard oxide coating formed on aluminum by an electrolytic treatment. Suitable for interior or maintained exterior surfaces, an Alumilite finish increases aluminum's resistance to abrasion and weather, retains the original appearance of the metal, resists dirt accumulation, and cleans easily.

Alloy—The appearance of an Alumilite finish may vary, depending upon the type of coating, the alloy on which it is formed and the surface pretreatment. Generally, No. 32 Alumilite Sheet, 6063 extrusion alloy and cast alloy F214 will match each other in appearance after comparable Alumilite treatments. Whenever possible, these are the alloys that should be specified when Alumilite finishes are to be employed and when a matching appearance is important.

Specification—To assure a proper finish, the Alumilite treatment number, coating weight and thickness should be specified as follows:

APPLICATION REQUIREMENT	ALUMILITE TREATMENT	MINIMUM COATING THICKNESS	MINIMUM COATING WT. PER SQ IN.
Minimum protection	202	.00025″	12 mg
Medium protection	204	.0004″	17 mg
Maximum protection	215	.0008″	35 mg

Specification Example: (for Alumilite over an etched Alply facing sheet requiring medium protection) *Alply aluminum facing shall have Alumilite 204R1* (pretreatments other than caustic etch R1 are also available) *treatment with a minimum coating thickness of .0004 in. and a minimum coating weight of 17 milligrams per square inch.*

Where Alumilite-treated surfaces are subject to stains and minor abrasions during construction, a lacquer coating is recommended.

ALCOA DECORATIVE COLORS (for interior use)

In addition to natural-color Alumilite, a complete range of richly colored Alumilite finishes are also available for use on Alply panels. Unlike Alcoa Architectural Colors, the colored Alumilite finishes are suitable for interior use only. Additional data is available from Alcoa sales offices.

CONSTRUCTION PROTECTION

Wet concrete, mortar and plaster can stain aluminum during construction. Where final appearance is important, facing exposed to such staining should be protected by a methacrylate-type lacquer coating. This is clear and wears off unnoticed over a period of years.

Lacquer Specification—*Apply two sprayed coats of water-white methacrylate lacquer having a total minimum thickness of .0006 in., which when applied to the aluminum surface shall be capable of withstanding the action of lime mortar for a period of at least one week in an atmosphere of 100% relative humidity at 100°F, the action of 10% (by weight) muriatic acid for a period of six hours at 70° F, and the action of atmospheric weathering for a period of 12 months. The coating shall be applied by Alcoa to exposed Alply aluminum facing subject to staining from alkaline mortar and plaster, abrasion and other construction abuses. Before application of lacquer, the manufacturer shall remove all fabrication compounds, moisture, dirt accumulations and other foreign materials to insure proper lacquer adhesion.*

PORCELAIN ENAMEL FINISH

This opaque porcelain coating is created by fusing fritted glass, which has been fine-milled with pigments, to the surface of aluminum by high-temperature firing (in excess of 800° F). It is highly alkaline and acid resistant and is relatively unaffected by weather. Since porcelain enamel on aluminum is thinner and has better adhesion than porcelain coatings on other metals, it can withstand much greater impact deformation without chipping. Should the porcelain be fractured by impact, the surrounding enamel will not chip back beyond the damaged spot. In addition, there will be no unsightly colored corrosion product formed to drain over the front face of the panel.

Color—Most colors can be obtained in porcelain. Color match is accurate

with no noticeable fading. From 35% to full gloss can be produced.

Alloy—All aluminum alloys are not equally suited for porcelain enameling. Those listed are specially produced to assure proper enamel bond and adequate structural properties after firing.

SHEET ALLOYS (for Alply panel facings)

- Alcoa No. 1 Porcelain Enameling Sheet—for higher strength properties and regular duty.
- Alcoa No. 3 Porcelain Enameling Sheet—Should be used only if, after firing, it meets the structural requirements of the particular application.

EXTRUSION ALLOYS (for accessory components)

- Alcoa No. 1 Porcelain Enameling Extruded Shapes—for higher strength properties.

For additional design data on porcelain enamel finishes, see Alcoa insert under Curtain Walls, SWEET'S ARCHITECTURAL FILE.

Finish Specification Example:

FACING MATERIAL—Alply panel exterior facing shall be Alcoa No. 1 Porcelain Enameling Sheet.

FINISHES—All porcelain enamel on aluminum indicated on accompanying drawings shall be manufactured by a qualified processor in accordance with TENTATIVE SPECIFICATIONS FOR PORCELAIN ENAMEL ON ALUMINUM AS USED FOR SIGNS AND ARCHITECTURAL APPLICATIONS (PEI: ALS-105) (57), *Porcelain Enamel Institute, Inc., 1145 Nineteenth St., N.W., Washington 6, D.C.*

TESTS—All porcelain enamel on aluminum shall meet tests in RECOMMENDED TEST METHODS FOR EVALUATION AND CONTROL OF QUALITY OF PORCELAIN ENAMEL ON ALUMINUM (PEI: AL-1a), *Porcelain Enamel Institute.*

ALCOA ARCHITECTURAL COLORS (exterior unmaintained surfaces)

These colors are a unique finish, electrochemically formed as an integral part of the aluminum surface. Developed by Aluminum Company of America for use on unmaintained *exterior* aluminum applications, Alcoa Architectural Colors increase weather resistance and have a high degree of color retention and permanency. A satisfactory color match may be expected when all of Alcoa's recommended procedures are followed.

Alloy—To obtain Alcoa Architectural Colors on Alply panel facing, Alcoa Anoclad Sheet made from special alloys and particular mill practices must be specified as shown under color samples, page 23. For color on extruded components, Anoclad Extrusions must be similarly used.

Design Suggestions—Because of the nature of the finishing process, minor shade variations can be expected from one colored element to another, particularly between sheet and extrusions. This inherent characteristic of the finish need be no problem if properly anticipated in the design. In most "linear" use of color—that is, in narrow members like sash, sills, mullions, frames, etc.—minor color variations are not noticeable. In large expanses of metal, such as with Alply sheet facing, it is best not to butt adjacent panels. Instead, such areas should be separated with mullions, battens, shadow lines or changes in plane.

Availability—Alcoa Architectural Color Finishes are available only from those independent contractors designated as Authorized Alcoa Architectural Color Processors. In addition to providing complete technical information on finishing procedures to these Authorized Processors, Alcoa maintains a Field Inspection Service in their plants. Approximately two dozen Authorized Processors in eighteen different states are presently in existence. A list of these, indicating plant location and colors processed, can be obtained from Alcoa sales offices.

Specification of Alcoa Architectural Color

FACING MATERIAL—Exterior Alply facing shall be Alcoa Anoclad Sheet Type .... (insert Type 10, 20, 30 or 40, depending on particular Alcoa Architectural Color desired.)
Anoclad Sheet Type 10—Gray 2010, Gold 4010
Anoclad Sheet Type 20—Gray 2020, Blue 3120, Brown 4120, Green 6020
Anoclad Sheet Type 30—Gray 2030
Anoclad Sheet Type 40—Gray 2140, Blue 3140, Brown 4040, Green 6040

FINISHES—Alply panel exterior facing shall be finished in Alcoa Architectural Gold 4010 in accordance with standards established by Aluminum Company of America. After etching, an anodic oxide coating shall be applied to a thickness of .0008 in. minimum and a coating weight of 35 milligrams per square inch minimum.

After recommended coloring and sealing procedures have been followed, facing shall be given two separate spray coats of an approved clear methacrylate lacquer, having a minimum total thickness of .0006 in.

TESTS—The finishes shall be such that they can be tested in accordance with the following ASTM *Specifications available from the American Society of Testing Materials, 1916 Race Street, Philadelphia, Pa.:* ASTM B*137-45—Coating Weight;* ASTM B*244-56—Coating Thickness;* ASTM B*136-45—Sealing. Coating thickness shall be checked by a Filmeter, and density of color by a Photovolt Reflection Meter.*

PROCEDURE—Color shade samples shall be submitted by the selected Authorized Color Processor for architect's and owner's approval before proceeding with production. These samples shall be used for comparison purposes during production finishing, and shall consist of actual panels or sections large enough so that good comparisons can be made to establish allowable color shade range.

ALCOA ALUMALURE FINISH FOR ALPLY

Alumalure is a baked synthetic resin enamel finish for aluminum, developed to offer decorative color and durability at a low cost. It is suitable for exterior or interior application and resists weathering very well. Alumalure may be applied to any alloy and is available on Alply panel facing. Such finished aluminum may be cut or drilled without chipping the enamel and, of course, without fear of corrosion stains forming at the cut edges. Type "A" Alumalure colors (Antique Gold A2-102, Pacific Blue A3-103, Silver Green A4-101 and Cambridge Gray A5-102) are aluminum pigmented to provide a distinctive metallic sheen; Type "B" colors (Bermuda Sand B1-101, Sunlight Yellow B2-101, Polar Blue B3-101, Viking Blue B3-102, Spruce Green B4-102, Sandstone Gray B5-101, Ermine White B6-101) are high-gloss enamels. (See color samples on page 23.) Additional information is available from Alcoa sales offices.

ALCOA TONE-COTE FINISH FOR ALPLY

Tone-Cote* is a roller-coated baked enamel finish which may also be specified for Alply panel facings. Additional information on this finish is available from Alcoa sales offices.

*Trademark of Aluminum Company of America

ALCOA ARCHITECTURAL COLOR

an electrochemical finish formed integrally with the aluminum surface

BLUE 3120
use Anoclad Type 20 Sheet

GRAY 2010 (natural aluminum color)
use Anoclad Type 10 Sheet

GOLD 4010
use Anoclad Type 10 Sheet

BLUE 3140
use Anoclad Type 40 Sheet

GRAY 2020
use Anoclad Type 20 Sheet

BROWN 4120
use Anoclad Type 20 Sheet

GREEN 6020
use Anoclad Type 20 Sheet

GRAY 2030
use Anoclad Type 30 Sheet

BROWN 4040
use Anoclad Type 40 Sheet

GREEN 6040
use Anoclad Type 40 Sheet

GRAY 2140
use Anoclad Type 40 Sheet

ALCOA ALUMALURE

a baked synthetic resin enamel

VIKING BLUE B3-102

ANTIQUE GOLD A2-102

BERMUDA SAND B1-101

SPRUCE GREEN B6-101

PACIFIC BLUE A3-103

SUNLIGHT YELLOW B2-101

SANDSTONE GRAY B5-101

SILVER GREEN A4-101

POLAR BLUE B3-101

ERMINE WHITE B6-101

CAMBRIDGE GRAY A5-102

These color samples represent as faithful a reproduction of Alcoa's finishes as can be obtained by a graphic arts process.

ALCOA SALES OFFICES

ABERDEEN, S. D.
304 Western Union Building

AKRON 8, OHIO
506 Akron Savings & Loan Building

ALBANY 7, N. Y.
90 State Street

ALLENTOWN, PA.
1132 Hamilton Street

ATLANTA 9, GA.
Alcoa Building, 1615 Peachtree St.

BALTIMORE 2, MD.
1007 Commercial Credit Building

BIRMINGHAM 1, ALA.
P. O. Box 2041

BOISE, IDAHO
1220 Vista Avenue

BOSTON 16, MASS.
20 Providence Street, Park Square

BRIDGEPORT 1, CONN.
Atlantic Street

BUFFALO (Tonawanda), N. Y.
2427 Sheridan Drive

CHARLOTTE 2, N. C.
1000 Wachovia Bank Building

CHATTANOOGA 2, TENN.
1205 Volunteer Building

CHICAGO 11, ILL.
520 North Michigan Avenue

CINCINNATI 6, OHIO
Alcoa Building, 2331 Victory Pkwy.

CLEVELAND 13, OHIO
1450 Terminal Tower

COLUMBUS 15, OHIO
230 Bryson Building

DALLAS 2, TEXAS
301 Thomas Building

DAVENPORT, IOWA
601 Brady Street

DAYTON 5, OHIO
207 Northtown Arcade

DENVER 6, COLO.
105 Fillmore Street

DES MOINES 12, IOWA
3620 Ingersoll Avenue

DETROIT 2, MICH.
610 New Center Building

FLINT 2, MICH.
510 Mott Foundation Building

FORT WAYNE, IND.
2924 South Calhoun Street Building

GARDEN CITY, N. Y.
1001 Franklin Avenue

GRAND RAPIDS 2, MICH.
812 Michigan National Bank Bldg.

HARTFORD 3, CONN.
410 Asylum Street

HOUSTON 2, TEXAS
1310 First City National Bank Bldg.

INDIANAPOLIS 7, IND.
2939 North Meridian Street

JACKSON, MICH.
1405 National Bank Building

KANSAS CITY 5, MO.
2300 Power & Light Building

LAFAYETTE, IND.
P. O. Box 500

LIMA, OHIO
901 National Bank Building

LITTLE ROCK, ARK.
414 Pulaski Street

LOS ANGELES 17, CALIF.
1145 Wilshire Boulevard

LOUISVILLE 2, KY.
1152 Starks Building

LUBBOCK, TEXAS
203 Field Building

MEMPHIS 17, TENN.
4515 Poplar Avenue

MIAMI (Hialeah), FLA.
490 Hialeah Drive Building

MILWAUKEE 3, WIS.
2040 West Wisconsin Avenue

MINNEAPOLIS 2, MINN.
1060 Northwestern Bank Building

NASHVILLE 12, TENN.
235 Wilson-Bates Building

NEWARK 2, N. J.
744 Broad Street

NEW ORLEANS 12, LA.
1225 Whitney Building

NEW YORK 17, N. Y.
230 Park Avenue

OAKLAND 8, CALIF.
1001 46th Street

OKLAHOMA CITY 5, OKLA.
P. O. Box 3251

OMAHA 2, NEBR.
746 Omaha National Bank Building

PEORIA, ILL.
614 Commercial Bank Building

PHILADELPHIA 9, PA.
123 South Broad Street

PHOENIX, ARIZ.
625G First National Bank Building

PITTSBURGH 19, PA.
1501 Alcoa Building

PORTLAND 4, ORE.
1115 U. S. National Bank Building

PROVIDENCE 3, R. I.
2503 Industrial Bank Building

RICHMOND 19, VA.
712 Southern States Building

ROCHESTER 18, N. Y.
Erdle Building

ST. LOUIS 8, MO.
10th Floor, Continental Building

SAN DIEGO 3, CALIF.
2962 Fifth Avenue

SAN FRANCISCO 4, CALIF.
2509 Equitable Life Building

SEATTLE 1, WASH.
1411 Fourth Avenue Building

SOUTH BEND 1, IND.
805 J.M.S. Building

SPOKANE 1, WASH.
610 Fidelity Building

SPRINGFIELD 3, MASS.
508 Tarbell-Watters Building

SYRACUSE 3, N. Y.
731 James Street

TAMPA 9, FLA.
4302 Henderson Boulevard

TOLEDO 2, OHIO
350 W. Woodruff Avenue

WASHINGTON 6, D. C.
1200 Ring Building

WHITE PLAINS, N. Y.
180 South Broadway

WICHITA 2, KAN.
1010 Central Building

WILMINGTON 1, DEL.
825 Bank of Delaware Building

WORCESTER 8, MASS.
22 Pleasant Street

YORK, PA.
205 Manufacturers Building

YOUNGSTOWN 3, OHIO
537 Ohio Edison Building

ALCOA INTERNATIONAL, INC.
230 Park Avenue, New York 17, N. Y.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

ALUMINUM COMPANY OF AMERICA

GENERAL OFFICES, 1501 ALCOA BUILDING, PITTSBURGH 19, PA.

Form 70-11265

Litho in U.S.A.

ALCOA SALES OFFICES

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ALCOA
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